



Controller's Quarterly

California Economic Challenges

Kathleen Connell, California State Controller

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Message From State Controller **Kathleen Connell**

In this edition of the *Controller's Quarterly*, we focus on a topic that has serious implications for California's economic expansion and competitiveness: meeting our state's growing need for highly skilled workers. Whether it's large companies or small businesses, growth depends on the availability of workers to fill jobs in the fast-growing high tech industries.

This is becoming a greater challenge than it has been in the past, principally due to the speed at which job requirements are changing. As many workers already in the labor force are discovering, new technologies can make the skills learned yesterday obsolete tomorrow. This is especially true in California, where being ahead of the technology curve is what allows companies to remain leaders in their field.

New strategies are needed to meet this exploding demand for workers with specialized and higher-level skills. To succeed, these strategies require emerging high tech industries to be actively and directly involved with California's community colleges, where the infrastructure already exists to provide this training. Such partnerships already are producing results, as our guest authors from two community college districts describe in this *Quarterly*.

In addition to its long-term strategy for training a high tech workforce, California must address concerns over immediate skills shortages. Two perspectives on this issue are presented by guest authors from industry and academia. These divergent views suggest a need for multiple solutions to California's workforce dilemma.

As California's chief financial officer, I am able to help bring together business leaders, representatives of the community colleges, and state decision makers to develop solutions to the state's workforce needs. We already have seen progress in the past year. However, the dialogue must be ongoing and the commitment constantly renewed. California's economic future, and that of its workers, is at stake.

KATHLEEN CONNELL

Controller
State of California

August 1998

California Economy

Controller's Outlook

The National Outlook

When the economy seemed like it could not get any better, it did. It was widely expected that the financial problems of many U.S. trading partners would cause first quarter 1998 growth of GDP to slow from the 3.7% increase seen in the fourth quarter of 1997. Instead, it accelerated to 5.4% in the first quarter of 1998. This occurred despite continued economic turbulence in Southeast Asia. A surge of imports from that part of the world failed to dampen the growth of the U.S. economy.

The decline in exports to Southeast Asia has been partially offset by increases in exports to Europe and Latin America. Also contributing to growth are increases in American incomes and consumption that allowed the nation to absorb both the increased output from the U.S. economy as well as the increased exports. The question is, how long will this continue?

A major factor in the first quarter's performance was inventory investment. The General Motors strike is likely to adversely affect growth in the second quarter, as will further deterioration in foreign trade. The June employment report appears to confirm this slowing in growth. Employment rose by 205,000 jobs in June, compared to more than 300,000 in each of the two previous months. Manufacturing employment, the sector most affected by the Southeast Asian downturn, dropped by 29,000 jobs on the heels of a 22,000 job loss in May.

The unemployment rate was 4.5% in June, up slightly from the low of 4.3% in April and May. By historical standards, this is still very low. The unemployment rate for college-educated workers is at a miniscule 1.7%. Jobs are growing at more than twice the rate of labor force growth. Labor force participation rates are at an all-time high. The tight labor market is beginning to exert upward pressure on wages. Average hourly earnings have risen 3.8% in the last 12 months, about twice the rate of inflation, and personal income grew by 5.8%, nearly three times the inflation rate. The rise in earnings and incomes is good news for American workers. However, it is not clear that the growing economy will continue without producing the spark of inflation the Federal Reserve would consider before hiking interest rates, putting the brakes on the economy.

The California Outlook

The California economy also has largely dodged the Asian flu. In the last 12 months, jobs have increased by 3.3% in California, compared to a national rate of 2.6%. The number of working Californians reached new highs in each of the last five months. The Controller's Council of Economic Advisors expects employment gains to remain high this year, with employment growing another 3.1% in 1998.

The Controller's Council projects that personal income in California will grow 6.6% in 1998. This is based on continued job growth and strong capital gains increases. Personal income and employment gains also have revived residential construction. The Council expects residential construction to total 125,000 units in 1998. While this is not a building boom, it represents an increase over the 111,000 units of 1997.

"The drop in exports to Asia has been offset by robust growth in exports to the state's other trading partners. Overall, California exports to the world increased by more than 6% in the first quarter of 1998 compared to the same period a year earlier."

Figure 1

1998 Forecast by Controller's Council of Economic Advisors

Council Member	Employment Growth (Annual %)	Unemployment (Annual %)	Personal Income Growth (Annual %)	Res. Building Permits (Thou)
LA Economic Devt. Corp. (J. Kyser)	3.2%	5.7%	6.7%	123
Calif. Assn. of Realtors (G.U. Krueger)	2.9%	6.0%	6.1%	130
UCLA Anderson Forecast (L. Kimbell)	3.4%	5.8%	7.5%	126
UC Berkeley, Center for Real Estate & Urban Economics (C. Kroll)	2.7%	6.2%	6.0%	120
Bank of America (J.O. Wilson)	3.2%	5.5%	6.6%	118
ARCO (A. Finizza)	3.2%	5.9%	6.5%	135
Mean	3.1%	5.9%	6.6%	125
Median	3.2%	5.9%	6.6%	125
State Controller	3.2%	5.8%	6.7%	125
1997 Actual*	3.3%	6.3%	7.3%	111

* "Actual" figures may vary from prior published figures to reflect new data that has become available.
Source: State Controller's Office; Council of Economic Advisors

Figure 2

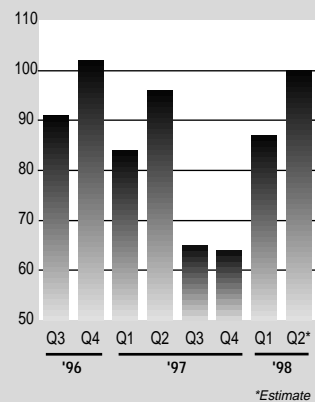
Change in Export Volume from CA to Major Trading Partners (In millions)

	1996	1997	% Change	1st Qtr 1997	1st Qtr 1998	% Change
Asia/Pacific	\$54,021	53,315	(1.3)	12,532	11,422	(8.9)
Europe	\$16,899	18,531	9.7	4,261	5,241	23.0
Canada	\$10,787	11,426	6.1	2,861	3,109	8.7
Mexico	\$9,087	12,082	33.0	2,460	3,210	30.5
Brazil	\$1,264	1,217	(3.7)	269	268	(0.1)
All Other	\$11,216	12,965	15.6	2,667	3,330	24.9
California Total	\$103,253	109,536	6.1	25,051	26,579	6.1

Source: MISER, University of Massachusetts; UCLA Anderson Forecast

Figure 3

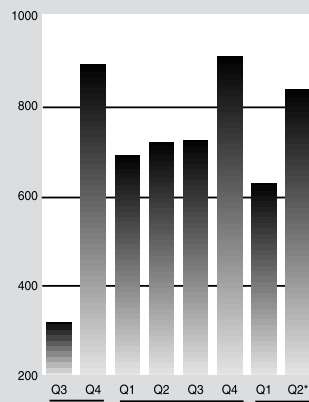
California Non-Farm Payroll Growth (Seasonally Adjusted, In Thousands)



Source: Employment Development Department

Figure 4

U.S. Non-Farm Payroll Growth (Seasonally Adjusted, In Thousands)



Source: U.S. Bureau of Labor Statistics

total exports to that part of the world are down only 8.9% in the first quarter of 1998 over the same period a year ago.

By contrast, the volume of exports to NAFTA partners and the rest of the world has boomed. (Brazil is the only South American country among California's top 20 destinations; while exports to Brazil have dropped, the volume was not large.) It is anticipated that exports to Asia will continue to deteriorate over the next few months, but it is hoped that the economies of Canada, Mexico, and Europe will continue to offset the losses.

Employment

The highest rate of employment growth over the past year occurred in construction, with an annual rate of increase from June 1997 to June 1998 of 9.9%. Industries that provide services continue to provide the majority of jobs in California (81%). Manufacturing has increased over the past year, up 1.8%, but it lags behind job expansion in general. Employment in the FIRE sector (Finance, Insurance & Real Estate) is finally showing growth now that the real estate industry has revived. Figures 3 and 4 compare non-farm payroll growth in California and the U.S.

In the first six months of 1998, the rate of increase in employment in Orange, Riverside, and San Bernardino counties has been higher than the state average. San Diego and Los Angeles counties continue to trail the state in job expansion but are matching the national rate of growth. This is good news for the state because the slow growth in Southern California has accounted for most of the drag on the California economy throughout this decade.

Real Estate

Real estate prices surged in 1997 and accelerated in 1998. Price appreciation has finally hit Southern California. Orange and San Diego counties are now seeing higher price gains than most of Northern California. According to DataQuick, in April, prices of single family homes sold in those two counties were 14.6% and 13.3% higher, respectively, than in April 1997. Sales activity also increased considerably over the past year, particularly in Southern California. San Diego County saw a 39.8% increase in the number of single family homes sold in April 1998.

Residential Construction

Residential construction finished the year with a flurry of activity. Permits totaled 111,000 units in 1997, up 17% over 1996. Permits sagged somewhat in the first quarter of 1998 due to El Nino. Construction is expected to pick up this summer. Nonresidential construction, both in the final quarter of 1997 and the first quarter of 1998, remained strong. The annual valuation of permits issued in those two quarters was the highest since 1989.

Personal Income

In the fourth quarter of 1997, personal income grew at an annual rate of 10.2%. It is believed that capital gains, particularly in stocks and stock options, played a large part in the extraordinary increase. Compensation in many Silicon Valley firms is supplemented by stock options, which show up as wage gains. Volatility in the stock market will impact this portion of personal income growth in 1998.

California's Challenge:

Educating the Workforce for a High Tech Economy

The presence of a skilled workforce is crucial to the economic well being of California. In turn, the state's education system is crucial to producing this skilled workforce. The following report examines issues pertaining to California's education system, including its responsiveness to a job market that increasingly calls for advanced skills and specialized training.

Why have workforce issues become so critical to California's fiscal health? The industries that are the state's principal economic drivers are technology oriented, including information technology, biomedical sciences, multimedia, and international trade. Their ability to grow and maintain a leadership position in the global marketplace will directly influence the economic fortunes of the state and its citizens.

Three decades ago, California schools were among the most respected in the nation. In recent years, however, attention has turned to the decline of student performance. Unfortunately, while educators and policy makers have been focused on improving student performance in schools, the nature of the jobs for which students were being prepared has changed. Serious questions must now be answered, includ-

ing how the education system should respond to the new workforce needs and where the best opportunities exist for students to obtain training for a high tech economy.

On the positive side, efforts underway since the early 1980s have produced improvements. Recent reports indicate that more California students are staying in school, attempting to attain college proficiency, and planning to attend college. As shown in Figure 1, California's high school dropout rate declined from 5.2% in 1990 to 3.9% in 1996.¹ During the same time period, the percentage of California high school graduates taking the SAT rose from 46.5% to 51.2%. In addition, the number of students completing the high school curriculum required for admission to California's four-year public universities increased from 32.6% to 37.9%.

A Widening Gap Between High School and College Standards

These positive indicators are accompanied by a less favorable trend, however, as fewer students in California are now eligible to enroll at the state's four-year colleges and universities. As college eligibility requirements have gone up, the percentage of high school seniors who fulfill all the requirements for admission to a University of California (UC) or California State University (CSU) campus has declined (Figure 2). This points to a widening gap between the skills achieved in high school for meeting the completion standards and the standards for college admission.

Under California's Higher Education Master Plan, the top 12.5% of the state's high school graduates are to be eligible for UC admission; the top 33.3% for CSU admission. The Califor-

"The industries that are the state's principal economic drivers are technology oriented... Their ability to grow and maintain a leadership position in the global marketplace will directly influence the economic fortunes of the state and its citizens."

Figure 1

California Students' Performance Indicators					
	HS Dropout Rate	HS Grads Taking SAT	HS Seniors Taking AP Exams	HS Students Taking College Prep	HS Grads Going to College
1990	5.2%	46.5%	10.0%	32.6%	56.1%
1996	3.9%	51.2%	13.2%	37.9%	53.1%

Source: California Postsecondary Education Commission

¹It should be noted that high school "graduation" data, in contrast to the "dropout" rates cited here, indicate California ranks near the bottom compared to other states in the percentage of its population that has graduated from high school. The U.S. Census Bureau derives graduation rates from surveys that include persons within an age cohort, such as 18-24, who may never have enrolled in high school; dropout rates are based on the number of persons who initially enroll.

"The data clearly indicates that K-12 schools need to meet a new set of standards in order to adequately prepare a workforce for California's growing high tech economy."

Figure 2

CA Students* Meeting All Eligibility Requirements for CSU and UC Admission		
	1990	1996
CSU	34.6%	29.6%
UC	12.3%	11.1%

* Of public HS graduates

Source: California Postsecondary Education Commission

nia Community College (CCC) System is open to any student who has completed high school or attained 18 years of age.

As Figure 3 demonstrates, however, the percentage of students enrolling in these institutions in 1996 is much lower than what is envisioned in the Master Plan.

The data clearly indicates that K-12 schools need to meet a new set of standards in order to adequately prepare a workforce for California's growing high tech economy.

Community Colleges: California's Main Pathway to Higher Education

Responding to the changes in California's workforce needs

requires identifying where the greatest impacts can be achieved. As the percentages in Figure 3 suggest, California's Community College System is the chief receiver of students seeking a postsecondary education in this state. These two-year colleges are also an important pathway for students to obtain a degree from a four-year institution, as many of the students enrolling in a community college later transfer to a CSU or UC campus.

A key question for California educators and policy makers is how to maximize the community colleges' vitally important role in training the workforce needed by the state's high tech industries.

Job Market Trends To Guide Education Responses

Three key trends are occurring that help explain the gaps between student performance in schools and their ability to successfully enter the high tech workforce. California's education systems need to recognize these trends in designing responses to workforce needs.

1. Job opportunities for unskilled high school graduates are shrinking.

Job shifts from the unskilled categories to the skilled areas have been dramatic over the past four decades, as depicted in Figure 4. With only 20% of U.S. jobs now falling into the "unskilled" category (down from 60% in the 1950s), a high school diploma alone no longer provides entry into most jobs. While there has been an increase in the number of students planning and preparing to go to a four-year college, this group comprises less than 40% of the students enrolled in California high schools. The far greater share, roughly 60%, either are not planning to attend a four-year postsecondary institution or cannot meet their admission requirements.

Most experts agree that in today's economy a high school diploma no longer leads to a job that provides a moderate to high wage. This raises a question that is critical to California's future economic prosperity: *What are the implications of having so many young Californians unable to participate in a job market that requires more advanced education and training, inasmuch as these jobs are in higher-paying industry sectors that are expanding?*

2. Most of today's jobs require higher-level skills, yet a majority of California's college entrants are not proficient in basic academic skills.

In the new economy, not only are the *types* of jobs changing, the *skills* needed for jobs are changing, too. Student performance on math and reading tests has become a key indicator of the success, or lack thereof, of California schools' instructional approaches. In addition, annual measures of

Figure 3

CA's First-Time College Freshmen As Percentage of CA High School Graduates				
	UC	CSU	CCC	All Public Colleges
1990	7.3%	10.4%	36.2%	53.9%
1996	7.8%	9.9%	35.4%	53.0%

Source: California Postsecondary Education Commission

students' basic skills in reading, writing, and mathematics provide California parents and employers with a grim picture of skills deficiencies across all student groups.

National tests in math and reading conducted by the National Assessment of Educational Progress (NAEP) in 1992 and 1994 rank California schools among the lowest in the nation. Equally discouraging is that between 1992 and 1994, reading scores declined for California's 4th grade students, a cohort now entering high school.

Despite an increase in the number of students taking college preparatory curriculum and Advanced Placement courses, many California students enter college without the required academic skills to succeed in college. The University of California reported that in the fall of 1997, almost 37% of freshmen admitted to a UC campus needed remedial English. In the CSU system, 47% required remedial English. Of the CSU freshmen, 55% failed the math proficiency exam.

The implications for California's economic development are dire. The basic skills deficit of California's students, a major educational issue for the past two decades, is now a critical economic issue for the state. The primary anchors of California's new economy — emerging high tech industries — require worker knowledge and abilities beyond the basic academic skills in which many college students are deficient. The skill levels of students approaching college are even worse.

3. There is a growing disparity between the skills students

currently are mastering within California's education system and the skills they need to obtain stable, well-paying jobs.

Many young people in California, including those high school students who are not going on to college, are receiving an education that is no longer applicable in today's economic environment. This poses a formidable challenge to California educators and policy makers to bring students up to the level that the job market will demand. The state has fallen behind in producing graduates for the demanding and financially rewarding jobs that its economy has been generating.

For California's population as a whole, a higher percentage of workers have college degrees

than in the rest of the nation. However, among California's younger workers (aged 25-34), a lower percentage are college educated compared to the rest of the nation. For the first time in its history, California is facing the prospect that workers who retire over the next ten years will be better educated than the young people entering the workforce to replace them.

California's high tech industries will be looking to these younger workers to maintain the momentum that has caused the state's economy to surge to this point. To support continued expansion and development of these industries, steps must be taken soon to ensure there is a workforce that is equal to the task.

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Figure 4

U.S. Job Shifts by Skill Category		
	1950s	1990s
Professional	20%	20%
Skilled	20%	60%
Unskilled	60%	20%

Source: "Teaching the New Basic Skills," Richard J. Murnane & Frank Levy, 1996

Preparing Tomorrow's Workforce



By Dr. Leo E. Chavez
Chancellor, Foothill-De Anza Community College District

Dr. Martha J. Kanter
President, De Anza College

"While the forces of globalization propel California's thriving 'new economy,' the state's education system continues its recession. ...California's Business Roundtable and others remain wary that students will not have the critical thinking, interpersonal, and/or cognitive skills needed to keep tomorrow's workforce strong."

While the forces of globalization propel California's thriving "new economy," the state's education system continues its recession. Attempts at recovery since the 1960 California Master Plan for Education have not succeeded. Technology has enabled us to have more information at our fingertips, but less knowledge is being acquired by California's students, especially in urban communities. California's Business Roundtable and others remain wary that students will not have the critical thinking, interpersonal, and/or cognitive skills needed to keep tomorrow's workforce strong.

The key industries of today include telecommunications, high tech manufacturing, computer software, multimedia, business and professional services, and biotechnology. To meet the demands of the new economy, 12th grade competency in reading, writing, and mathematics is a minimum. Additionally, employers report that proficiency in computing,

communications, marketing, and management will be essential for success in the future.

With these goals in mind, Silicon Valley companies are becoming more active partners with the academic community. One such example is the Workforce Design Team of Joint Venture: Silicon Valley. The Workforce Design Team consists of human resources vice presidents and directors from most of the Valley's large corporations. They work directly with college presidents, chancellors, and school superintendents developing specific workforce preparation strategies for the K-16 pipeline. This group has identified specific job categories and their required skill sets. In response, the region's community colleges are collaborating to meet precise benchmarks, such as increasing the number of graduates who possess the identified skill sets.

Two significant issues have evolved from this effort: 1) the need for a real "working" partnership between industry and education; and 2) the need for companies to view workforce needs from a long-term perspective. Providing sites for internships while students complete high school or college, subsidizing on-the-job training for new employees direct from community colleges or universities, and accessing qualified applicant pools for job openings made available by community colleges and universities are additional ways industry can and should respond to meet immediate and future workforce needs.

To address the growing gap between employment growth and labor shortages, and in response to these calls for action, De Anza College, Foothill College, and a number of our education partners are doing things differently than in years past.

Several new initiatives have been tested and are now in place to deliver workforce training and general education.

Assessing the Need

The Foothill-De Anza Community College District has undertaken a series of economic development surveys to assess educational needs of corporations and small businesses throughout the Silicon Valley. The data gathered are used to redesign vocational education programs and meet new needs in emerging and fast-changing fields (energy management, animation, networking, and biotechnology, to name a few). Survey results also have led the colleges to create distance learning, online courses, and a variety of interdisciplinary offerings. De Anza's Distance Learning Center now enrolls more than 8,000 students a year, with the Associate in Arts degree available via television. "Weekend college" and onsite corporate classrooms also were established.

Growing Our Own

Rather than blaming teachers, schools, or changing family conditions, De Anza College and the Fremont Union High School District established two high school programs on the college campus. Middle College, with high school faculty onsite at De Anza, targets at-risk, academically talented students who might otherwise drop out. After seven years, the program now boasts a 95% or higher completion rate. Its students earn high school diplomas and get a head-start on their college education. Similarly, "College Advantage," an accelerated program for high school seniors, was established; more than 100 students completed their final year of high school in advanced

courses on the college campus. This partnership enables students to finish college in three rather than four.

Growing Our Own is also expressed in a third way. In partnership with Mt. Pleasant High School, Silicon Graphics, and Disney, De Anza College trained high school faculty in animation. High school students gain critical skills for jobs in the multimedia market and benefit from industry internships and support. Some enter the workforce directly; others transfer to De Anza College or four-year universities to gain more advanced skills for the multimedia industry. A similar operation is being designed with Cisco Systems to link Cisco's local high school "networking academies" with higher education and workplace opportunities at every level. What is different about this? Engineers and college faculty are working together to reshape the curriculum on an ongoing basis to keep pace with industry changes.

Connecting California's "New Majority" to Education, Jobs

In California, more than 80% of all minority students who enter higher education enroll first in a California Community College. To assist low-income students, all 106 community colleges and 22 California State Universities offer financial aid, targeted outreach, academic support, tutoring, and jobs. Such services are essential to keeping these students on track toward college degrees and higher-paying jobs. But higher education support is not enough.

As the California Business Roundtable suggests, the business community must invest in these students, partnering with the academic community to provide mentors, internships,

and jobs for California's new majority populations, now vastly underrepresented in the higher-skilled workforce. We remain concerned that California continues to import foreign workers while significant numbers of Latino and African American students drop out of Silicon Valley high schools. High expectations and high standards must be set for students in our own area so they will be able to access the high-wage, high tech jobs so prevalent in this region.

The De Anza College Advanced Technology Center is used by 10,000 students a day. For every high tech class offered in this facility, there are 50 to 150 students on the waiting list. Salaries of working professionals in the industry are two to three times higher than those of professors who teach Autocad, ProEngineer, Java, or C++ at a community college. Similarly, the high salaries available in private industry for network server administrators and webmasters are double the salaries at our community colleges. These colleges could prepare thousands more students for the workforce every quarter if we had three things: access to high tech facilities for teaching, competitive salaries for professors, and infrastructure support for the technology needed in the classroom. We are confident that more "new majority" Californians can be trained for the jobs in the new economy, but we cannot do this without the support of business.

Increasing Education's Responsiveness to Business

To respond to the need for more highly trained workers, the academic community must accelerate its pace and find ways to curb failure at all levels of education. In the past two years,

California State University-Hayward implemented a fast-track Mathematics and English refresher month for all incoming students who failed the placement exam. In a one-month intensive academic immersion program before the college opened in the fall, more than 70% of the students passed the make-up exam and began the semester with the college-level preparation they needed. At Foothill-De Anza, students underprepared for college are placed in basic skills courses to learn technical skills for entry-level jobs; they also upgrade their language and mathematics competencies to become competitive for higher-paying jobs in the future.

Conclusion

For the new century, the education recession must be stopped by creating a seamless, interconnected system of knowledge acquisition, lifelong learning, and good jobs. California's very best intellectual capital from teachers, business and civic leaders working together must be invested to improve education with a rich curriculum, high standards, high expectations, and clear accountability. Internships and paid jobs for students while they are learning and advancing in their skill sets, financial support, and proper facilities will be needed. A program of "new sabbaticals" for the "new economy" faculty could provide opportunities for teachers to maintain currency in the classroom. Similarly, local communities and the State should provide attractive fiscal incentives for entrepreneurial institutions that want to do things differently as we collaborate to build a highly skilled labor force, second to none.

"California's very best intellectual capital from teachers, business and civic leaders working together must be invested to improve education with a rich curriculum, high standards, high expectations, and clear accountability."

San Diego Colleges Team Up with the Biotech Industry



By Augustine Gallego
*Chancellor, San Diego
Community College District*

"Among the more than 200 biotech companies in the San Diego area, some 40 products are in late-stage development... Since both the cost and availability of land and water in San Diego County are factors that work against the retention of biotech manufacturing operations, the availability of a specialized technical workforce gains greater importance as a counterbalancing factor."

San Diego's colleges and universities are gearing up to meet the changing workforce needs of the nation's third largest biotechnology region as the industry emerges from a research and development phase to product manufacturing.

Among the more than 200 biotech companies in the San Diego area, some 40 products are in late-stage development. Decisions to remain in San Diego and build production facilities in the region may hinge on workforce issues. Since both the cost and availability of land and water in San Diego County are factors that work against the retention of biotech manufacturing operations, the availability of a specialized technical workforce gains greater importance as a counterbalancing factor.

Many of the biotech firms were lured to the region during the research and development stage of their businesses by the resources of the Salk Institute, Scripps Institute, and the University of California San Diego (UCSD), while other biotech companies sprouted from these talent-laden institutions.

The San Diego Community College District has also been helping entrepreneurs hatch biotech companies through its

Technology Incubator at San Diego City College. Among the ten start-up companies currently housed at the college and receiving technical and administrative support are a protein purification small-batch bioprocessing firm and a biotech calibration company. A recent "graduate" who moved out of the Technology Incubator when the company was strong enough to succeed without incubator assistance now specializes in clean room and environmental controls for the biotech industry.

San Diego City College is the only community college in the nation that is helping biotech companies to grow right on campus through a technology incubator, according to Joan Stepsis, dean of the San Diego Community College District's Center for Applied Competitive Technologies (CACT). The San Diego CACT has been designated California's Bioscience Workforce Development Center by State Controller Kathleen Connell.

Since the late 1980s, San Diego County community colleges have been working with industry to develop and implement programs to train entry-level R&D lab technicians for biotechnology companies, with programs at MiraCosta College, Miramar College, and San Diego City College. The Southern California Biotechnology Center located at MiraCosta College has been building a bioscience technician pipeline with outreach efforts to students and teachers at middle schools and high schools.

In addition, with the assistance of San Diego City College, Palomar and Southwestern colleges have launched pilot industry-taught and faculty-coordinated courses, which may develop into full R&D technician training programs, if the local biotech industry continues to grow.

Industry's current concern, however, is the need for well-

trained technicians skilled in the operation and maintenance of sophisticated manufacturing facilities and production operations in highly regulated and quality-sensitive environments.

Both UCSD and San Diego State University plan to offer new degree programs to meet the industry's changing workforce needs. The community colleges have several new training programs planned, including San Diego City College's new Bioscience Manufacturing/Production Technician Program. The program has already recruited a full class of students for small-batch bioprocessing training during the spring 1999 semester.

As home to the California Bioscience Workforce Development Center, the CACT at San Diego City College is also working with the California Community College system to develop relevant bioscience curricula and delivery systems for statewide dissemination. The community college system recently granted City College \$250,000 to develop a program to train biotechnicians for large-scale manufacturing operations.

In addition to the biotech R&D and manufacturing technician programs at San Diego City College, the Bioscience Center there has received a \$73,000 grant from the California Community Colleges Chancellor's Office to work with industry to develop a bio-medical equipment maintenance and repair technician program. San Diego Mesa College has plans to support the industry with a new chemistry technician program that will begin classes next year.

The success of our bioscience programs is attributed to the fact that they are developed by the industry, taught by industry, and evaluated by industry. And, as the industry grows, our college programs will grow to meet industry needs.

America's High Tech Workforce: Supply Is Not Equal to Demand



By Thom Stohler

*Director,
Human Resources Policy
American Electronics Association*

America's high tech industries are driving national economic growth, totaling 4.5 million high-wage jobs by 1997. California is at the center of much of this growth. Between 1994 and 1996, almost 84,000 net new high tech jobs were created in California, for a total of more than 720,000 jobs. High tech positions in California pay an average salary of \$57,971 — a 21% increase since 1990. California high tech companies export goods valued at more than \$68 billion — representing 60% of California's international trade. High tech continues to lead not only California's economy but also the nation's economy, in growth and job creation.

Rapid economic growth has greatly increased the demand for highly skilled workers in the high tech industry. The supply of computer scientists and electrical engineers is not keeping pace with the industry's employment needs. A short-term solution — such as using temporary foreign workers under the H-1B visa pro-

gram — helps high tech companies meet immediate workplace needs. However, the long-term solution for meeting the employment needs of the high tech industry is to improve our education system and provide workers with the ability to receive training in the latest technological innovations.

High Tech Industry Employment in the U.S.

The U.S. high tech industry is comprised of many segments, such as computers, semiconductors, and communications equipment manufacturing. These segments require many types of knowledge workers, including electrical engineers, integrated circuit design engineers, product engineers, computer programmers, and software engineers. High tech manufacturing companies have become the largest manufacturing sector in the U.S., employing 1.9 million workers. Software, Internet, and communications services have grown rapidly since 1990, creating hundreds of thousands of new jobs. The rapid growth in the high tech industry has resulted in a shortage of highly skilled workers.

The Federal Reserve Board recently noted that tight labor markets continue to hamper business activity due to "the apparent imbalance between the demand and supply of workers, especially skilled workers in technology-related fields." The Fed reports shortages of technical computer workers and engineers across the country. More troublesome, the Federal Reserve Board notes that already some firms are scaling back high tech manufacturing production or expansion plans due to the short supply of engineers and information technology workers.

The rapid employment growth in high tech is expected to continue. The computer and office equipment industry is projected to be the fastest-growing industry in the nation through 2006, at an annual growth rate of nearly 15%. The software and data processing services industry is projected to grow at 9.3% annually; employment is expected to double from 1.2 million in 1996 to 2.5 million by 2006.

An examination of occupational employment provides a different perspective with the same conclusions. The three fastest-growing occupations over the next decade will be in the very rapidly growing computer and data processing services fields. The rapid advances in computer technology have increased demand for trained specialists like computer engineers, computer systems analysts, database administrators, and computer support specialists. The U.S. Bureau of Labor Statistics predicts that demand for these occupations will more than double by 2006.

Future Supply of Workers Inadequate to Meet Employment Demands

The U.S. high technology industry needs the best and the brightest, with the right skills and education, to maintain its global competitive edge. There is increasing concern within the industry about the decline over the past decade in the number of high-skilled, highly educated workers entering the workforce with science and engineering degrees — the high tech industry's most valuable resource.

The data shows that the number of bachelor's degrees in electrical engineering and computer sciences has dropped pre-

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"Between 1985 and 1997, the number of bachelor's degrees in engineering decreased 16%; mathematical/computer science degrees decreased 29%; electronics and communications engineering degrees decreased 37%; and the number of degrees in computer and information sciences decreased 42%. Comparing these numbers against projected industry growth strongly suggests that if present trends continue, homegrown technical talent will not keep pace with the needs of the high tech industry."

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Foreign Nationals Receiving More Degrees at American Universities

While the number of students graduating with critical degrees is declining, the number of foreign nationals receiving degrees in computer science and electrical engineering has increased. In 1997, 11% of all Bachelor of Science degrees in computer engineering and electrical and electronic engineering by U.S. universities were awarded to foreign nationals. At the graduate level, 42% of all Master of Science degrees in computer engineering and electrical and electronic engineering awarded by U.S. universities were to foreign nationals. Almost half (48%) of all Ph.D.s in computer engineering and electrical and electronic engineering awarded by U.S. universities were to foreign nationals.

The Skills Gap

High tech companies continue to demand skilled workers, while the supply of Americans with the needed skills continues to decline. At the same time, a growing number of graduates from American universities with the skills demanded by high tech companies are foreign nationals. The way high tech companies

have met these challenges is to use the H-1B visa temporary worker program to fill positions with highly skilled workers. However, this short-term solution does not address the long-term problem: training American workers to meet the demands for highly skilled workers in the high tech industry.

The Solution: Better Education and Training

To meet the future workforce needs of the high tech industry, the most important step is to continue to invest in the nation's current and future workforce. Workforce characteristics identified by the American Electronics Association (AEA) member companies as critical to the success of high tech companies are strong technical and analytic skills, communication skills, and teaming skills. Companies also have recognized that the supply chain of qualified workers is no longer just the K-12 level; the skilled workforce supply chain is K-Ph.D.

It is critical for the high tech industry to continue to address workforce training. A significant amount of company resources are spent on training and retraining, university investments, community college partnerships, and K-12 commitments. The industry is committed to continuing this high level of support in the supply chain. At the same time, the industry needs to maximize the productivity of the current workforce by encouraging life-long learning and building incentives to keep the current workforce "work ready."

Current Workforce Skills Do Not Match Demands of the 21st Century

Do we have enough skills in our current workforce to drive the U.S. economy into the 21st

century? The indicators suggest we do not.

Although all current projections anticipate tremendous growth and job creation in most of the high technology sectors, the current labor pool of qualified workers is, at best, stagnant and, in some cases, shrinking. As the demand for technology workers and knowledge workers from key academic disciplines has grown stronger, the number of graduates in key technology disciplines has declined in many technical disciplines.

For those potential workers not needing university level degrees, the prospects are no more promising. The performance of our elementary and high school students is disappointing when compared to the children of our foreign competitors. This is evident in the results of the Third International Math and Science Study (TIMSS), released in February 1998. TIMSS showed that U.S. twelfth graders scored 19th out of 21 countries in math and 16th out of 21 countries in science. The nation's elementary and secondary education systems simply are not doing an adequate job of preparing students in math and science skills necessary to compete in the workforce of the future. Many do not even possess core competencies. There is no industry that has been more supportive of public education and education reform in terms of both dollars and commitment of human resources than the high tech industry. This is the key to our future success.

All these factors point to the growing problem faced by the high technology industry when trying to recruit and retain skilled workers. There is no sign of changing this trend unless industry, government, and the education community all work together on solutions.

Bit Wise and Megabyte Foolish: Hiring Policies That Harm the Computer Industry and the State



by Norman Matloff
*Professor of Computer Science,
University of California, Davis*

What Shortage?

Press reports of a shortage of computer programmers ring hollow for Bay Area resident Paul Petersen. Laid off at age 40 (and replaced by a much younger worker) three years ago, he has been unable to find another job as a programmer.

Similarly, claims that “education is the answer” to an alleged software labor shortage bring bitter responses from Peter Van Horn, 31. A former aerospace engineer, he went back to school to pursue a Master’s degree in computer science after hearing about the supposedly “hot” job market in the computers area. Van Horn thought he would receive multiple job offers before he even finished the program, as reported in breathless newspaper articles. Yet he struggled for four months in Silicon Valley, not even getting interviews, before finally landing a programming job.

Even Van Horn is lucky compared to Bard-Alan Finlan, 43. He too went back to school

to change careers, earning a Bachelor’s degree in Computer Engineering at UC San Diego. Yet he has been unable to find full-time work in the computer area. He currently works as an electronics technician, a much lower-level job typically done by high school graduates, paying half what programmers and engineers make. Even this job is only temporary, with no benefits. Finlan has applied four times a major high tech employer in San Diego that says it is desperate to hire engineers, yet the firm has never even given Finlan an interview.

The claim of a desperate high tech labor shortage is a myth. Firms across the board, large and small, both software vendors and those who develop software for internal use, only hire between 1% and 5% of their applicants. If employers were desperate, they simply could not be so picky.

Similarly, Urban Institute economist Robert Lerman points out the claims of a shortage do not jibe with the fact that programmer salaries increased by only 7% last year. If you were an employer who was desperate to hire, wouldn’t you be willing to pay a premium of more than 7%?

The only “shortage” is that of cheap labor. What the frustrated workers profiled above have in common is that they are all older, victims of rampant age discrimination in the computer industry. The older workers are shunned, due to a perception that they need higher salaries and have families which impede their ability to work 80-hour weeks like the childless 22-year-olds.

Even Van Horn, at age 31, is “old.” A major Silicon Valley firm claiming a desperate labor shortage classifies anyone with

six years of experience — typically only of age 28 — at the “Senior” level. At another prominent Silicon Valley company, the CEO dismissed a question on corporate downsizing by saying, “The half-life of an engineer, software, hardware engineer is only a few years.” Sued several times for age discrimination, the firm considers the hiring of young people so important that it has a special acronym for them, RCG, for “recent college graduate.”

Industry lobbyists point to the low unemployment rate for programmers, but this information is virtually useless, since people are forced to leave the field when they fail to find programming work. Paul Peterson, the programmer mentioned earlier, was forced to take a job as a sales clerk at one-third his former salary. He does not count in unemployment data, but clearly he is vastly underemployed.

Twenty years after graduation, only 19% of computer science majors are working as programmers. True, some of them go into management, start their own consulting firm, and so on. But the same is true for civil engineers, and yet 20 years after graduation 52% of them are still working as civil engineers. The difference is that technology changes much faster in the computer world, and this gives employers a pretext on which to shun the older workers, saying they lack currently “hot” skills.

Another source of cheap labor consists of foreign nationals here under the H-1B work visa program. Several independent studies, including one by an immigration attorney, have shown that the foreign-national programmers and engineers are paid on average 15% to 30% less than comparable natives.

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The U.S. Department of Labor, which administers the H-1B program, found that the program was rife with abuse. It is quite telling that the number of H-1B work visas requested by industry for computer programmers increased by 352% from 1990 to 1995, during which time the number of programming jobs increased by only 35%. Amazingly, the computer industry business magazine, *Red Herring*, actually admitted in a July 1998 editorial that the industry hires H-1Bs as a source of cheap labor and, even more amazingly, actually endorsed the idea.

Education is Not the Answer

Industry lobbyists in 1997 and 1998 pushed Congress to increase the yearly cap on H-1B visas, asserting that "Johnny can't/won't do computer science," causing an alleged software labor shortage. The lobbyists claimed that university computer science enrollment is plummeting. This was a clever tack but thoroughly misleading, as the examples of the highly educated but underemployed programmers profiled above show.

University computer science enrollment is not declining. On the contrary, it is skyrocketing, having doubled in the last two years. This should put to rest the claim that American students have neither the background nor the interest to go into this field.

The second aspect of education is subtler but even more important, namely, retraining. As mentioned earlier, employers reject older applicants for

programming positions on the grounds that they do not have the latest software skills. Thus, the "solution" would appear to be establishment of retraining programs.

This misses the entire point. Suppose, for example, an employer has a project using the new Java programming language. An experienced programmer could take a Java course, say, at the local community college, but employers would not hire him or her on that basis. They insist on actual job experience in Java.

Instead of squandering public and private monies on retraining that will not address the real issue, we must attack the roots of the problem, which are age discrimination and a desire for cheap labor.

Bill Halchin knows the problem well, because in his case he does have the latest skills — network protocols, Java, and so on — yet he still was unemployed for four months in early 1998. (When he did find a job after that time, even that was only temporary.) Halchin's resume reads like a *Who's Who* of famous industry firms. Moreover, he has nearly two decades of experience in operating system kernel design. Yet when lobbyists for a major Silicon Valley firm stated there was an industry need to hire H-1Bs to fill kernel development positions for lack of U.S. workers, Halchin applied and was not even given an interview.

Conclusions

The people of California are spending very large amounts of money to train computer

scientists at the University of California and California State University campuses. Yet they are not getting a reasonable return on this investment, since the industry is limiting programming careers to only about 10 years.

Meanwhile, the coffers of the state treasury are suffering from huge opportunity costs. The older programmers and engineers who are working in technician or sales clerk jobs for salaries at levels one third to half of their former pay are contributing less in California taxes.

Meanwhile, sad to say, many California high tech employers would actually rather leave positions unfilled than hire older programmers and pick up new skills on the job. This is bit wise, megabyte foolish on the part of the employers. Any competent programmer can pick up a new software skill in a couple of weeks, learning on the job, without formal training.

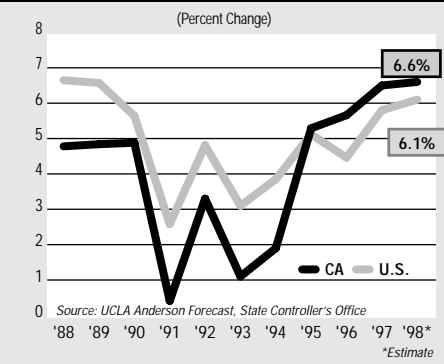
Moreover, by insisting on certain software skills, employers are needlessly driving up salaries in those narrow segments of the labor market corresponding to those skills. This is also causing frequent job-hopping, and each employer left in the lurch suffers heavily. In addition, by hiring on the basis of skills instead of talent, employers are often not getting the best talent. This has a severely negative impact, since studies show there is a 10-to-1 range in productivity among programmers.

In the end, no one is the winner in this process — the programmers, the taxpayers and, least of all, the employers.

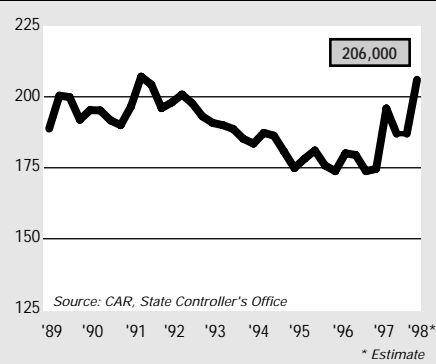
Facts and Figures

Important Information About California

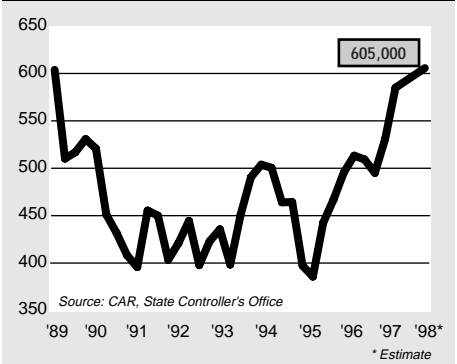
Per Capita Income Growth, CA vs U.S.



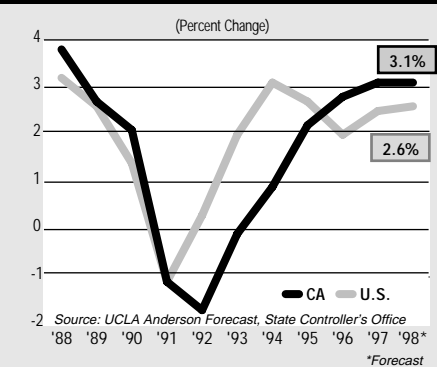
Median Home Price (In Thousands)



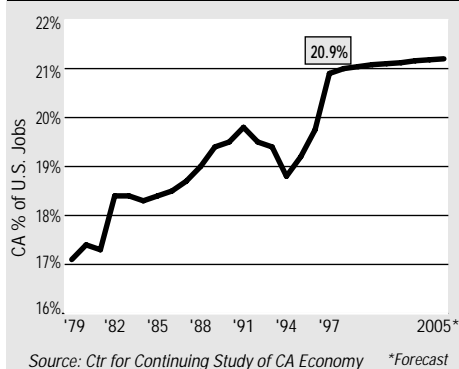
Single Family Home Sales (In Thousands)



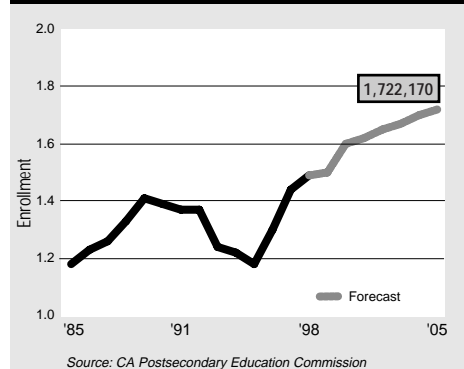
Non-farm Employment Growth, CA vs U.S.



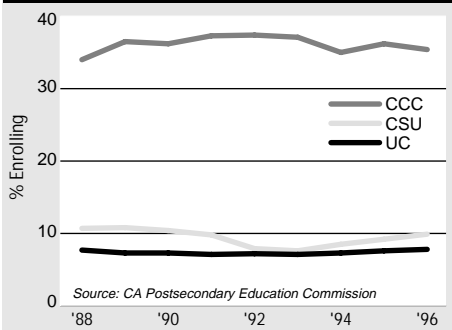
CA's Share of U.S. High Tech Jobs



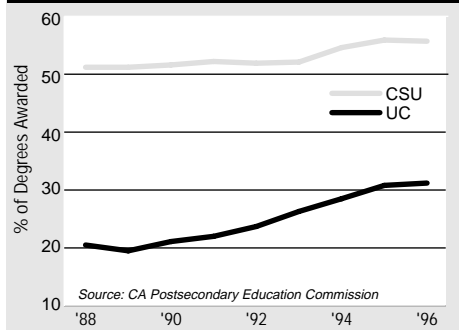
CA Community College Enrollment (In Millions)



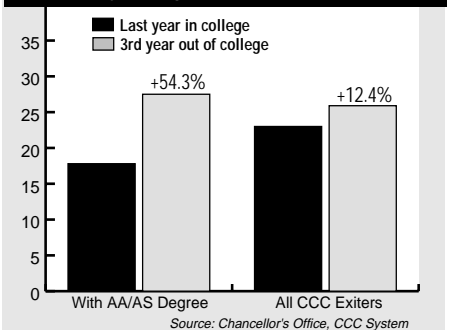
CA High School Grads Enrolling in CA Colleges/Universities



Degrees Awarded by UC & CSU to CCC Transfer Students



Real Earnings Gain for CA Community College Grads (In Thousands of Dollars)



In Upcoming Editions of the Controller's Quarterly:

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